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# ALLOCATION OF ARMY RESOURCES TO THE SPACE MISSION AREA

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## ABSTRACT

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The Department of Defense's Space Policy, Joint Publication 3-14, Joint Doctrine for Space Operations, and other sources make clear the importance of space and space forces to current and future US military operations. Throughout these documents and discussions, the joint nature of space operations is made clear, to include its recent reaffirmation by the transfer of the military space portfolio and the associated components from all of the services to the new US Strategic Command.

In order to fulfill its assigned responsibilities and to properly address its interests in space systems, capabilities and exploitation, the Army must train soldiers with the right skills, assign them to the right organizations and have properly constituted and vigorous organizations whose missions incorporate space-related responsibilities. This paper will examine the current and future missions and interests of the Army with respect to space capabilities. It will then examine the skill sets, personnel assignments and organizations that are and will be required to meet the Army's needs for space capabilities from the perspectives of doctrine, training and organization. It compares current organizations with those that arise from its analysis and presents recommendations for addressing those discrepancies that it identifies.

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## ALLOCATION OF ARMY RESOURCES TO THE SPACE MISSION AREA

The US today is dependent upon the capabilities and opportunities represented by the exploitation of outer space. Space contributes roughly $100 billion to the Nation's economy annually.[1] The civil, commercial and military infrastructure of the United States relies on space capabilities in a myriad of ways. This was recognized by the 2000 Commission to Assess the United States National Security Space Management and Organization (hereafter referred to as the 2000 Space Commission) which stated in its final report to Congress that, "services supplied from space are already an important part of the US and global infrastructures."[2]

This paper examines the question of whether the Army has allocated sufficient organizational, people and training resources to the execution of its Space Mission Area interests and responsibilities for Space Control, Force Enhancement, Space Support and Force Application. It reviews the Space-related missions assigned to the Army and its need for space systems to support its current operations and, more importantly, Objective Force operations. It looks at the Army's current resource allocation to these areas and it then discusses and proposes the organizational constructs that seem most likely to meet the Army's need for infusion of space capabilities on 21st Century battlefields. It also addresses the Army's need for soldiers—officer, warrant officer and enlisted—and civilians who can become space professionals and the skill sets and space training or education that are appropriate for each. Finally, it compares the current resources allocated to space by the Army with the proposals made herein to provide an assessment of whether or not the Army is appropriately preparing itself for the addition of space as one of the dimensions of the modern battlefield.

### WHY IS SPACE IMPORTANT?

As a first step toward understanding the importance of space to the Army, the term space should be defined. For the purposes of Joint Vision 2020, the Objective Force and this paper, space refers to the spherical region surrounding the earth and its atmosphere in which aeronautical forces do not apply, in which the earth's gravity is the predominant factor affecting the movement of objects and in which the focus of activity is the earth and the people living on it. For practical purposes, this identifies space from 100 to 250,000 kilometers (62 to 155,000 miles) above the surface of the earth. It is this region that has seen most of human activity in space and in which most contemporary commercial space ventures and military space systems operate.

TO THE WELFARE OF THE US

Of key importance to the US is its commercial space activity, the most prominent elements of which are its satellite manufacturers, the satellite portion of its telecommunications industry and its space launch industry. In particular, it benefits the US to have a vibrant launch industry comprised of multiple firms which can routinely and reliably place into orbit the satellites on which we have come to rely and which serves as a complement to our domestic satellite producers and satellite operators. The US national security interest benefits from the domestic space launch industry because this helps to prevent inappropriate technology transfers from potentially occurring if US satellites are launched by non-US launch services.

Weather satellites may represent the biggest but least acknowledged space contribution to the US economy. Due to the improvements in weather forecasting and storm tracking which satellites have made possible, losses to our economy from unanticipated storms have been reduced. More accurate forecasting minimizes the need for evacuations to areas truly in the paths of major storms (e.g., hurricanes) and civil authorities and the public are provided with adequate time (several days instead of a day or less) to prepare for severe weather. Additionally, on-orbit monitoring of macroscopic environmental and climatological effects has made possible the recognition of the depletion of the ozone layer over the Antarctic and the impact of the El Niño phenomenon on the annual weather patterns over the United States.[3] Yet these satellite systems are rarely credited for the contribution they make.

Imagery is another relatively mature exploitation of space capabilities. Although pioneered in the US by the Department of Defense (DoD), National Aeronautics and Space Administration (NASA) systems began providing imagery to the public in the 1970s. In the 1980s, NASA expanded imagery systems to portions of the electromagnetic spectrum outside of the band which is visible to the human eye. Today, there are US and foreign commercial satellite systems on-orbit that provide capabilities exceeding NASA's LANDSAT spacecraft and that begin to approach the capabilities which once were the sole province of the militaries of the US and USSR. Applications of imagery include:

- Geodesy – making actual measurements of the terrain features or topology of the earth's surface.
- Mapping – locating natural and manmade objects and their precise position on the earth's surface.
- Terrain analysis – assessing the current condition of portions of the earth's surface to determine its character and trafficability for military and non-military conveyances.

- Land use and usage trends – monitoring the ever changing use by humans of the land which they occupy.
- Surveillance – monitoring specific movements and actions by others; while primarily a governmental function, today several commercial systems provide an effective if somewhat less precise capability to perform surveillance.

Since the late 1980s, space-based navigation has become a significant contributor to not only the US economy but indeed to the world economy. The Global Positioning System (GPS), whose signals are available publicly, has become the global standard for navigation and for synchronized, accurate timing. Although the GPS system itself is underwritten and operated by the DoD, the utility of using it for navigation has resulted in a booming market for GPS receivers which are manufactured and sold commercially for dozens of applications. These applications include recreation, air traffic control, one of the two primary timing reference sources for Internet routers, search and rescue and *in-transit visibility* or *total asset visibility* of items in shipment—one of the enablers of the money-saving *just-in-time supply chain management* which has allowed many industries to reduce their on-the-shelf stockage to nearly zero, improving efficiency and reducing costs.

Since the first decade of the Space Age, satellite communications have played a tremendous role in bringing the world closer together. Throughout the 1960s to the 1980s, communications via satellite was the sole means of providing rapid, reliable communications that spanned the globe and it was the most prosperous and largest commercial exploitation of space. Although during the 1990s fiber optics became an equally key contributor to global communications, satellite communications continue to be the most practical and often the least expensive means of providing communications to less-developed portions of the world, including rural regions of First World nations.[4,5] It remains the optimum means of broadcasting large amounts of information from one source to many geographically dispersed destinations, is often the most cost-effective way to provide wideband communications from a fiber head to individual customers, and is used to enable paging systems which cover broad geographic areas (as the entire United States).

## TO US NATIONAL SECURITY

While space is important to the commercial and economic vitality of the United States, it plays at least as significant role in maintaining the security of the United States. The US military today leverages space capabilities to achieve superiority over potential adversaries. The current Joint Publication 3-0, Doctrine for Joint Operations, states that Joint Force Commanders

(JFCs) "exploit the advantages that space operations provide."[6] The pre-decisional National Military Strategy released in September 2002 notes that "the Joint Force will require unfettered access to space."[7] The 2000 Space Commission asserted in its 2001 report that, "the present extent of U.S. dependence on space, the rapid pace at which this dependence is increasing and the vulnerabilities it creates, all demand that U.S. national security space interests be recognized as a top national security priority."[8] This is particularly true for providing US military forces with Information Superiority—one of the foundations of Joint Vision 2020 and a critical enabler to ensure the Army's Objective Force can see and understand first.[9,10] Space is the essential enabler for assuring that US expeditionary forces projected anywhere on earth will always have the Information Superiority upon which they rely. As the draft Organizational and Operational Concept for Space Support to the Army Transformation Force states, "space is the most critical of all of the Army's combat multipliers because space-based systems make possible the transfer of information" at long ranges and between highly dispersed, rapidly moving forces.[11]

Information Superiority builds on a variety of space-based systems and capabilities. The US relies on space-based, satellite-hosted sensors for a tremendous amount of its intelligence, surveillance and reconnaissance (ISR) information, not only to support warfighting forces but also for strategic warning. Military forces rely on weather forecasts based on satellite monitoring of the earth's environment at least as much as do the civil and commercial sectors. Our armed forces have come to expect the accurate, current mapping information which satellite imagery and geodesy have made possible. The GPS system which the DoD pioneered and operates makes possible the precision targeting of US weapons systems, provides accurate position, navigation and timing (PNT) information to US forces anywhere on the planet and enables a variety of Blue Force tracking systems, such as Grenadier Brat.[12]

Underpinning all of this is satellite communications—a field in which the US DoD was a pioneer throughout the 1960s and 1970s.[13] As the US military fulfills the expectation Americans have for it to protect the national security on an expeditionary basis across the globe, the only means of delivering responsive, flexible, continuous, reliable, robust communications to forces as they deploy to an area of operations and then execute their mission is satellite communications.

## SPACE IS A VITAL US NATIONAL INTEREST

Space has become a significant element of the US infrastructure, a contributor to US economic vitality and essential for use by the national security community. The 1999 DoD

Space Policy and the 2001 Quadrennial Defense Review recognize these points and state that, ". . . the ability of the United States to access and utilize space is a vital national security interest."[14,15] The 2000 Space Commission "unanimously concluded that the security and well being of the United States, its allies and friends depend on the Nation's ability to operate in space."[16] An example of the increasing value of space to the US is the current Federal Aviation Administration program to base navigation in the US National Airspace System on the GPS by 2015.[17] The growing importance of space to the United States has led to an ever-increasing interest in the need for the US military to be prepared to protect US interests in space. In the 1980s, the military services created their own space commands and in 1985 the US Space Command was activated as one of the unified combatant commands. Throughout the 1990s, US Space Command worked to operationalize the US military's capabilities in space—striving to make them routine, seamless elements of a JFC's capabilities.

One result has been the publication of Joint Publication 3-14, Joint Doctrine for Space Operations, in August 2002. It points out that US dependence on space ". . . can be viewed by adversaries as a potential vulnerability. . ." and states that it is now "US Government policy that purposeful interference with US space systems will be viewed as an infringement on the Nation's sovereign rights."[18] It goes on to identify and define four mission areas for DoD space operations:

- Space Control – providing freedom of action in space to friendly forces while denying it, when directed, to an adversary.
- Force Enhancement – multiply effectiveness of Joint Forces by enhancing battlespace awareness.
- Space Support – launch, deployment, sustainment and recovery of space forces, including the control of satellites and their payloads while in orbit.
- Force Application – attacks against targets on earth conducted by military weapons systems operating in or through space.[19]

The publication of this document shortly before the merger of US Space Command with US Strategic Command to form a new US Strategic Command (STRATCOM) with a broader set of global responsibilities emphasizes that the US military's use of and interest in space and in operationalizing space capabilities continues to grow.

**OTHER NATIONS AND SPACE**

As space has become more important to the US, the success of the Nation's industry in exploiting space has led other nations to gain access to space capabilities by using their own

resources and obtaining access to satellites belonging to third-party nations or commercial entities. There are several nations that can be considered space-faring nations as well as the US. For the purposes of this paper, a spacefaring nation is defined as one which has its own space launch capability and its own production capability for space vehicles or satellites. Nations that qualify are Russia, China, Japan, India, France and the European Union via the European Space Agency (ESA).[20] Other nations may well qualify as the Objective Force becomes reality; these include Israel, North Korea, Brazil and Pakistan.[21] These nations represent commercial as well as possible military partners with and competitors to the US and its capabilities in space: they routinely compete their launch services against the launch services offered by US firms and are often able to do so successfully, posing a challenge to the sustained economic vitality of the US launch industry. Of particular concern is that these nations can develop space denial capabilities with which they can attempt to degrade US capabilities in space even if they cannot directly compete with those US capabilities.

Other nations can develop their own independent space launch capability or they can turn to these nations and their space launch capabilities to obtain access to space. Perhaps more importantly, nation-state and non-state actors can easily gain access to commercial space capabilities today by purchasing space-generated products or leasing space-based capabilities.[22,23] Often, these capabilities are provided by international firms with no specific allegiance to any one Government. This is especially true in the satellite communications marketplace, where most providers are international consortia, e.g., Intelsat, Eutelsat and INMARSAT.

The commercial space industry today is composed of several distinct specialties. The oldest are satellite monitoring of the earth's weather and climate and satellite communications. These applications were pioneered in the 1960s by the governments of the US and the USSR and, recognizing potential commercial application, industry quickly leveraged these early efforts. Today, the satellite communications industry is vibrant and there is an emergent commercial satellite imagery industry with competitors from several nations.[24] Additionally, there are tremendous commercial applications of weather and climate monitoring satellites and of space-based navigation: the Russians currently operate their own navigation system, GLONASS, and ESA is working to develop and deploy a European navigation system that has been named Galileo. [25,26] Although such satellites are owned and operated by government organizations, the services they provide have a tremendous and growing customer base throughout the civil and commercial sectors of all nations and the benefits they deliver can be measured in billions of dollars of productive output across the planet each year.[27] In the case of navigation, an entire

multi-national industry for GPS receivers has evolved over the decade of the 1990s, leading to tremendous improvements in the size, diversity and functionality of these receivers and resulting in innovative ways of employing them.[28] The best and most important example is the employment of GPS receivers in conjunction with simple satellite communications transmitters to provide in-transit tracking of items under shipment, which has security as well as economic benefits.[29,30]

Other nation states—some of them close US allies, some clearly competitors and potential future adversaries—and space-capable non-governmental organizations (NGOs) are strong competitors to the United States and its industry in space.[31] Such entities have the ability to compete with the US when it comes to space-derived awareness of and communications throughout a battlefield. A nation which does not have its own space capabilities and which contemplates or actually enters hostilities with the US could challenge US space superiority and mitigate US information superiority by using commercial space systems available to all or by accessing space capabilities of a spacefaring nation with which it is able to maintain friendly relations. Of equal import, other spacefaring nations could attempt to deny, negate, disable, or destroy US space capabilities if they were to enter into conflict with the US or its allies. The 2000 Space Commission asserted that nations "hostile to the U.S. possess, or can acquire on the global market, the means to deny, disrupt or destroy U.S. space systems by attacking satellites in space, communications links to and from the ground or ground stations that command the satellites and process their data."[32] China's leaders have made statements and published papers in which they make clear that they perceive US space systems as a vulnerability which other nations can attack in lieu of more conventional targets.[33,34]

**THE ARMY AND SPACE**

The recognition that space capabilities had become an essential element of the national security infrastructure was one of the reasons that led to the creation of the unified and service space commands in the mid-1980s. The Army realized that its use of space capabilities was as important and beneficial as the use of space by any of the other services—a realization validated by the Army's success in employing GPS navigation and satellite communications during Operation Desert Storm in 1991.[35,36]

Currently, the new STRATCOM continues the unified focus on the space mission area which was previously provided by US Space Command. As shown in Figure 1, the 14th Air Force, the Naval Network and Space Operations Command and the US Army Space and Missile Defense Command (SMDC) are its space-focused components, providing operational

space forces and capabilities to the STRATCOM Commander. The Army is a full partner in this unified structure, contributing space capabilities that benefit warfighting units in all of the services.

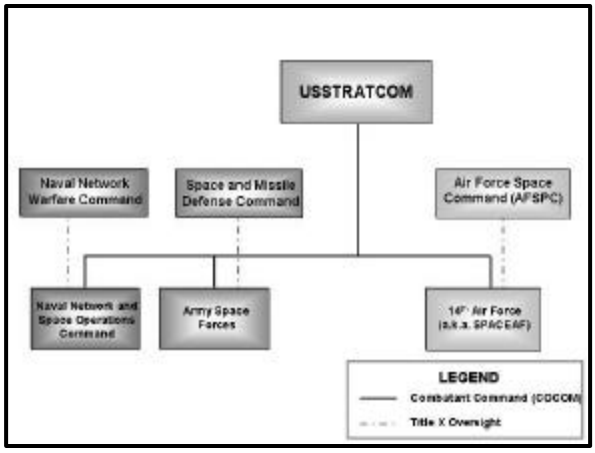


FIGURE 1. USSTRATCOM AND ITS SPACE COMPONENTS

HISTORIC ARMY ROLES

While not focused on space, the Army relies on space capabilities just as it does on air and sea capabilities as part of its integrated warfighting capability. The Army was a pioneer in developing the Nation's space capabilities. Army Space Command's motto, "First in Space," recognizes that the Army was responsible for the design, construction and launching of America's first successful satellite, Explorer I. The Army has been building and operating ground terminals for use with DoD's communications satellites since the early 1960s. Throughout the 1970s and 1980s, the Army worked to develop small, portable receivers for use with the GPS satellites and initiated the Tactical Exploitation of National Capabilities (TENCAP) program to provide intelligence information from surveillance satellites to army and corps commanders.

Today, the Army and SMDC contribute in many ways to the successful employment of space capabilities by the US military. The Army's contributions and roles fall into the mission areas of space control operations, space support operations and force enhancement operations. Within the area of space control, the Army serves to protect and preserve portions of the terrestrial component of DoD's space assets, primarily various control and communications facilities. Through US Army Kwajalein Atoll, it operates three unique radar systems, the Advanced Research Projects Agency (ARPA) Lincoln C-band Observable Radar (ALCOR), the ARPA Long-range Tracking and Identification Radar (ALTAIR), and the Tracking and Discrimination Experiment (TRADEX), which provide the ability to track all types of objects in space as they pass within radar view of the Kwajalein Atoll.[37] It also continues to play a role in assuring access to DoD space capabilities while potentially denying use of space capabilities to a hostile nation by developing systems to deny access to or directly attack on-orbit satellites with means such as radio frequency jamming equipment and the ground-based Kinetic Energy Anti-Satellite (KE-ASAT) weapon.

In the area of space support operations, the Army fills a key role in the day-to-day operation of the Defense Satellite Communications System (DSCS) which provides Super High Frequency (SHF) wideband, high data rate satellite communications to the US military. Army soldiers control and supervise the resource allocation of the DSCS communications payloads and provide a back-up DSCS satellite control capability from six facilities around the world.

When it comes to force enhancement operations, the Army excels in applying space capabilities, often in innovative ways, to meet warfighting requirements. Army Space Support Teams (ARSSTs) provide, in coordination with Joint Space Support Teams (JSSTs) from USSTRATCOM, space expertise to Army and land force component commanders. The teams ensure the availability of precision position, navigation and timing information from the GPS to deployed Army forces and preparie enemy and commercial space order of battle assessments as part of the space intelligence preparation of the battlefield. SMDC soldiers, in conjunction with members from each of the other services, operate the Regional SATCOM Support Centers (RSSCs), which support warfighting and other units in need of SATCOM by planning how to best meet their requirements using the DSCS, Ultra High Frequency (UHF) SATCOM, MILSTAR Extremely High Frequency (EHF) SATCOM, or leased commercial SATCOM.

The Army also provides topographic and mapping information in cooperation with the National Imagery and Mapping Agency (NIMA), orbital predictions for friendly and other satellite systems and, in cooperation with the Navy, theater missile warning to deployed forces via the Joint Tactical Ground Station (JTAGS). The Army has been a pioneer in combining two space capabilities—GPS position information and satellite communications—to enable Blue Force tracking through systems such as Grenadier Brat and OmniTRACS.[38] Further, the Army's communicators and space operators clearly have a responsibility to work within the joint environment to prepare a space communications infrastructure that will enable the concepts of Joint Vision 2020 and the Army's Objective Force to become reality.

## FUTURE REQUIREMENTS

The advantages that space offers will be essential enablers for fulfilling the capabilities demanded of the Objective Force and Joint Vision 2020. Air and sea power became integral elements of warfare in the 20th Century. In like manner, space power is becoming an integral element of 21st Century warfare. Furthermore, just as the military had to learn to interweave land, sea and air power into an effective joint force to achieve success during the conflicts of the 20th Century, it is now identifying how to weave the new dimension of space power into its tapestry of capabilities. From the military perspective, space capabilities are only worthy of

investment insofar as they can be applied to achieving here on earth the political goals of the United States and other nations.[39] For the foreseeable future, the relevance of space can only measured by the value it can add to life, commerce, politics and war on the only planet humans inhabit.

Joint Vision 2020 states, "The label full spectrum dominance implies that US forces are able to conduct prompt, sustained, and synchronized operations with combinations of forces tailored to specific situations and with access to and freedom to operate in all domains – space, sea, land, air, and information."[40] The purpose of these operations will be to achieve the political objectives of the Nation when the other means of national power—informational, economic and diplomatic—are unsuccessful in doing so. These realities demand that, more than in the past, the Army be able to incorporate space power and capabilities as seamless elements of the capabilities it provides to Joint Force Commanders on future battlefields. It demands that the Army be an informed, active advocate, user and defender of space systems and capabilities.

Both Joint Vision 2020 and the available information describing the Objective Force envision strategically agile, rapidly deployable military forces able to fight to gain entry into a theater and able to fight once in a theater until their assigned missions have been accomplished.[41] Both make clear the need for comparatively small units which operate while widely dispersed in a theater of operations and which coordinate their actions to achieve mass effects by maintaining a constant shared operational understanding of their mutual battlespace.[42,43] Both rest on a foundation of assured, continuous information superiority for the US military.[44,45]

These demands can only be met by integrating space capabilities into the Objective Force as seamlessly as US capabilities in the other dimensions of military power—land, sea, air and information.[46,47] The United States Army White Paper on Concepts for the Objective Force states:

> To maximize the full combat capability of sensors and communications, the Objective Force requires linkage from the satellites down to the Soldier on the ground. Space communications provide an opportunity for command and control on the move, including the capability for en route mission planning and the ability to maneuver in compartmented and urban terrain. Space surveillance, reconnaissance, and tracking capabilities help provide the situational awareness to see and understand first—increasing lethality and survivability. Space assets also provide the capability for a smaller deployed footprint with "reach back" and "push forward" tailored communications capabilities. The careful design of space platforms to meet future requirements can also help reduce the design weight of ground systems. In addition, this increasing importance of space has not escaped the attention of potential adversaries who have also begun examining

> and fielding ways to exploit space to benefit their aims. This emerging threat requires a capability for space control to deny potential adversaries the ability to see us, and attack us from space. All of these demands make it essential for The Army to aggressively support efforts to improve and increase the space capabilities of the US.[48]

The Objective Force Task Force in its 14 October 2002 draft Objective Force in 2015 White Paper states:

> Army space operations are the critical enabler that provides the means for achieving information superiority and full spectrum dominance . . . requiring the complete integration and synchronization of space capabilities within the Objective Force and assured access to space products and services by headquarters and operational units.[49]

Clearly, space is vital to achieving the quality of firsts of the Objective Force: Seeing First, Understanding First and Acting First which together permit US Army forces to win decisively.

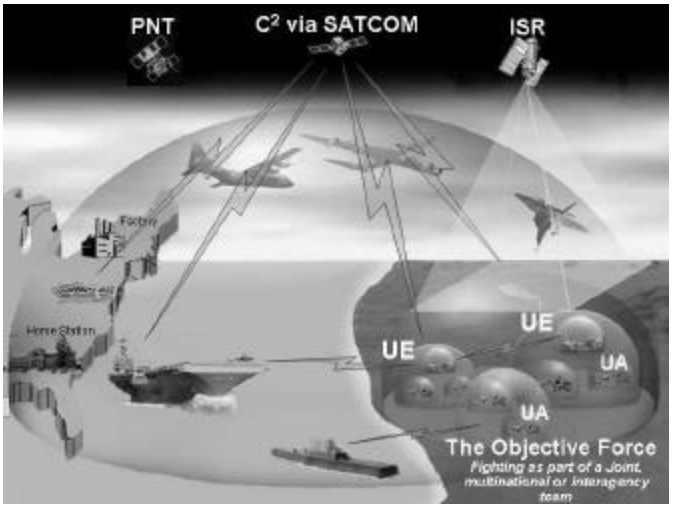


FIGURE 2. SPACE IS THE KEY ENABLER FOR THE OBJECTIVE FORCE

Secretary of the Army Thomas White and the Army Chief of Staff, General Eric Shinseki, affirm in their 2002 Statement on the Posture of the United States Army that, "Terrestrial systems alone will not enable full spectrum dominance. Space is a vertical extension of the battlefield and a key enabler and force multiplier for land force operations."[50] The Army's Training and Doctrine Command, in a November 2002 briefing to explain its proposed concept for space operations that will support the Objective Force, highlights that the Objective Force is built on a foundation of Information Superiority enabling Battle Command, Precision Fires, ISR, Dominant Maneuver, and Maneuver Sustainment and emphasizes that space-based systems are essential to providing the information required for all of these areas.[51]

**SPACE AND TODAY'S ARMY FORCE**

As the aforementioned documents make clear, capabilities from US space systems have become an integral part of land warfare and will continue to grow in importance in the future.

Operation Enduring Freedom (OEF) in Afghanistan, executed as part of the Nation's War On Terrorism which is global in nature, was a showcase for the integration of space capabilities into Army operations. Soldiers made use of GPS for precise position and timing information; weather satellites for monitoring and predicting the weather throughout the Joint Operations Area (JOA); satellite imagery and altitude data for maps and the production of virtual three-dimensional *walk* and *fly-throughs* which permitted them to see terrain features as they would appear once the soldiers began a mission; and military and commercial satellites for assured, continuous communications as they operated in a highly dispersed, low density manner.[52] Brigadier General Richard V. Geraci, SMDC's Deputy Commanding General for Operations noted that, "Near-real-time video from Predator Unmanned Aerial Vehicles (UAVs), relayed by orbiting communications satellites, is being used to identify and attack targets on the ground."[53] Satellite communications not only relayed data collected by UAVs across vast distances but also enabled their operators to remotely control them across those same distances. Numerous media carried stories and images of Army Special Forces soldiers mounted on horses using GPS to fix their position and that of a target and satellite phones to call for incoming fire support by Precision Guided Munitions (PGMs).

For most of the past two decades, the Army has recognized the growth of its reliance on space which was demonstrated throughout OEF. The creation of the Army Space Command and its later merger with the Army's Strategic Defense Command to create the US Army Space and Strategic Defense Command—the precursor to today's Space and Missile Defense Command—have given the Army a sound organizational foundation for space on which it can build. However, the Army is still in the early stages of instilling comfort with space amongst all of its leaders, developing a cadre of space experts, and creating warfighting-focused operational units that deliver space capabilities to the Army and Joint Forces. This operationalization of space is something the Army must do if space is to become a routine element of Army operations.

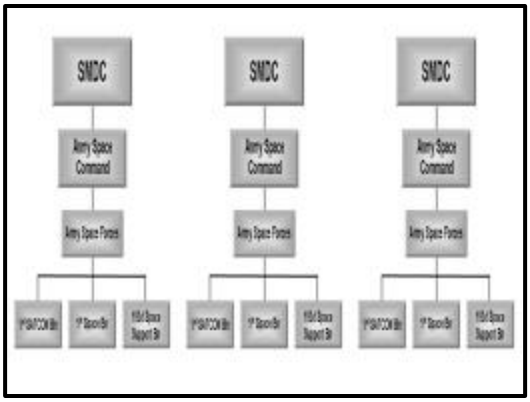


FIGURE 3. THE ARMY'S CURRENT OPERATIONAL SPACE FORCES

The current emergence of operational units within SMDC by which SMDC will provide space capabilities to the Army is one appropriate way of operationalizing space within the Army. Figure 3 shows the overall organizational structure of these units. They are the 1st Satellite

Control (SATCON) Battalion, the 1st Space Battalion and the 193d Space Support Battalion. The advent of the Functional Area 40 – Space Operations career field for officers is another step in the right direction for bringing space capabilities into the Army. By creating a small cadre of officer space professionals, the Army has begun to grow, for itself and the joint community, experts who are as proficient with space skills as they are warfighting skills. Table 1 shows the current strength and allocation throughout the DoD of the Army's Space Operations officers.

| | SMDC | ARSPACE | Army Space Forces | Space Bn | Space Spt Bn | SATCON Bn | Space Cntl Bn | Army Staff | Joint Staff | Unified Com-mands | Navy & USAF Units | OSD/ Defense Agencies | MACOM Staffs | USASOC | TOTALS | *Multiply by number of each:* Army | Corps | Divi-sion |
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| **Warrant Officer** | | | | | | | | | | | | | | | | | | |
| W5 | | | | | | | | | | | | | | | 0 | | | |
| W4 | | | | | | | | | | | | | | | 0 | | | |
| W3 | | | | | | | | | | | | | | | 0 | | | |
| W2 | | | | | | | | | | | | | | | 0 | | | |
| W1 | | | | | | | | | | | | | | | 0 | | | |
| | | | | | | | | | | | | | | | **0** | | | |
| **NCO** | | | | | | | | | | | | | | | | | | |
| E9 | | | | | | | | | | | | | | | 0 | | | |
| E8 | | | | | | | | | | | | | | | 0 | | | |
| E7 | | | | | | | | | | | | | | | 0 | | | |
| E6 | | | | | | | | | | | | | | | 0 | | | |
| E5 | | | | | | | | | | | | | | | 0 | | | |
| E4 | | | | | | | | | | | | | | | 0 | | | |
| | | | | | | | | | | | | | | | **0** | | | |
| **DA Civilian** | | | | | | | | | | | | | | | | | | |
| GS15 | | | | | | | | | | | | | | | 0 | | | |
| GS14 | | | | | | | | | | | | | | | 0 | | | |
| GS13 | | | | | | | | | | | | | | | 0 | | | |
| GS12 | | | | | | | | | | | | | | | 0 | | | |
| GS11 | | | | | | | | | | | | | | | 0 | | | |
| | | | | | | | | | | | | | | | **0** | | | |
| | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | **Total** | **116** | **4** | **1** | **0** |
| | | | | | | | | | | | | | | *Multiplier:* | | 5 | 4 | 18 |
| | | | | | | | | | | | | | | | | **20** | **4** | **0** |
| | | | | | | | | | | | | | | **Total Force:** | | **140** | | |

TABLE 1. CURRENT SPACE OPERATIONS BILLETS

The Army also has a good number of Department of the Army civilian employees (DA civilians) who are space literate—knowledgeable about space and experienced in applying space capabilities to military requirements. Unfortunately, it does not have a career field and professional development plan for civilians which permits them to focus on space and be promoted based on their space expertise. Similarly, the Army has no career field for Non-Commissioned Officers (NCOs) who have space expertise. The Army provides space awareness training to its senior leaders and is providing an initial space indoctrination course to its Space Operations officers. Most senior Army officers today are aware that the US benefits from tremendous space capabilities and that many of these are employed by the military. But, for the most part, these capabilities remain far-removed from field units and poorly understood.

## SPACE AND THE ARMY'S OBJECTIVE FORCE

The Army must do a better job of giving its forces the understanding, expertise and operational experience of incorporating space as another element of the combined arms team. Drawing from the Army's discussion of the Objective Force and how the Objective Force will be employed, one can identify space-focused tasks that the Army must accomplish if it is to bring its vision for the Objective Force to fruition. Fundamentally, future military operations will need coordination and integration of capabilities that derive from a broader range of environments than the AirLand Battle doctrine of the 1980s. Joint Vision 2020 and the documents describing the Objective Force vividly describe a future in which warfighters will command forces throughout a comprehensive battlespace consisting of the land, sea, air, space and information domains or dimensions. To help commanders incorporate space into their operations, the Army will need to have space professionals which it places throughout its force structure. It will not require a major new organization to further benefit from space capabilities; however, it will need to continue to evolve the capabilities of its Space and Missile Defense Command. At the same time, the integration of space into the five-dimensional battlespace of 21st Century battlefields means that the Army must continue to fulfill the roles it fills today in providing space capabilities to its Objective Force units and space forces and capabilities to the STRATCOM Commander as he fulfills his assigned responsibilities for space and space operations. Not only will the Army's commitment to fulfilling these tasks affirm its recognition of the importance of space to joint warfare, it will also serve to assure the Army a continuing cadre of space professionals.

### CONTINUING ROLE AS A COMPONENT TO US STRATCOM

The Army needs to continue to fulfill the tasks assigned to SMDC in the space mission areas of space control, space support and force enhancement. Given the growing importance of the integration of space capabilities and the mandate for each of the Services to grow a cadre of space professionals, the tasks the Army fills today will continue and will expand as it transforms itself into the Objective Force of 2015 and 2020.[54] This means that, while working in support of the STRATCOM Commander, the Army will explore undertaking additional tasks for which the Army can best support the integration of space into the Nation's quiver of warfighting capabilities.

One critical example is the area of space control.[55] Under current international practice, introducing weapons into space will almost certainly be viewed by the international community as a provocative action. All nations today publicly subscribe to the practice of treating space as a sanctuary into which weapons will not be introduced.[56] While not a violation of treaty or

international law—unless weapons of mass destruction are placed in space—the introduction by any nation of weapons into space would put an end to this practice. However, the US dependence on space capabilities, especially for the Objective Force and Joint Vision 2020, requires that the US military be prepared to respond to the introduction of weapons into space by other nations—with the likely intent to threaten, degrade, negate, disable or destroy US on-orbit space systems. The Army can develop and offer an array of space control capabilities which will be highly effective when employed against satellites in all low-altitude earth orbits, in many medium-altitude earth orbits, and even against systems in geosynchronous earth orbits.

Such Army-developed systems can remain on the ground until such time as they are needed, permitting the US to assure its ability to execute space control and maintain space superiority over any potential adversary. Ground-based systems provide the US with the ability to prosecute space control missions without placing the US in the position of being the first nation to actually introduce weapons into space—an advantage today and for the foreseeable future in the diplomatic realm of national power. Given the importance of space to the Objective Force, the Army must also develop the organizations and doctrine to ensure that such systems are employed in a timely, responsive manner to maneuver commanders. This approach builds on one aspect of the Army's historic contribution to the Nation's space capabilities: the development of the Kinetic Energy Anti-Satellite weapon system. The KE-ASAT was designed to strike orbiting satellite systems with a projectile moving at high speed, thus destroying the satellite but, unfortunately, creating a resultant orbital debris field. Although the Army developed this capability, it was never formally fielded or declared to be operational. The advantage of ground-based systems is that they provide an approach to achieving space control which is consistent with the current DoD Space Policy that calls for the US military to be ready to defend US space systems, if directed, subsequent to interference with those systems by either a nation-state or a non-nation state actor.[57] There are a variety of ground-based systems which the Army can develop and field to assure US space control and superiority including jammers, lasers and directed-energy weapons, recognizing that concerns with orbital debris have led the Office of the Secretary of Defense (OSD) to suspend active development of and support for kinetic energy-based anti-satellite (ASAT) efforts.

## SPACE CAPABILITIES CRITICAL TO THE OBJECTIVE FORCE

Three space capabilities in particular are essential to the Objective Force and its units of action and employment. First and fundamentally is satellite communications.[58] Whether provided by US or allied military systems or obtained from the commercial sector, satellite

communications are a vital enabler to a strategically responsive and agile Objective Force. Satellite communications are the only means by which a deploying force can remain linked to the DoD's Global Information Grid and obtain continuous battlespace awareness of the theater of operations it will be entering and to perform en route mission planning and rehearsal.[59, 60] Additionally, satellite communications may be the only means of establishing reliable, continuous communications between units of action and between them and the unit of employment or Joint Force Commander directing their actions once an Objective Force element has entered a theater and begun operations. In view of the dispersed battlefields projected by Joint Vision 2020 and the Objective Force concept, either high-altitude manned or unmanned relay aircraft or satellites will be essential to keeping the Army's dispersed forces in constant communication with each other. [61, 62,63] Even if high-altitude airborne relays are developed and fielded, satellite communications will be necessary to provide redundant, layered communications to ensure constant, uninterrupted communications and to provide the reachback communications from the theater of operations to the Global Information Grid via which the home station, the Continental US (CONUS) sustaining base, and National-level intelligence information can be accessed.

The second space capability of fundamental importance to Objective Force units is space-based ISR coupled with space-based mapping, geodesy and environmental monitoring. The information provided by space-based assets will in many cases be the best initial source of current information regarding the theater of operations. By virtue of being based in space, these systems are able to collect information that is current within hours or days—or even minutes if the data can be distributed in near-real time to users who require the information. They routinely and recurrently pass over most portions of the earth's surface, providing the ability to focus on a specific area or give a broad overview of a region. They can provide much of the data which will inform an Objective Force unit of the current situation it will be facing as it arrives in theater, to include current road networks and the trafficability of the terrain throughout the theater. Once in-theater, Objective Force units will have their own complement of diverse intelligence-gathering capabilities and be linked to the intelligence-gathering capabilities of the rest of the Joint Force. However, as descriptions of the five-dimensional 21st Century battlespace make clear, space systems will continue to be integral to gathering the data to assure Information Superiority within a theater's Joint Operational Area. This will be especially true when it comes to providing Objective Force units awareness of threat dispositions and movements in their areas of interest—portions of which may well be beyond the reach of the collection range of their organic sensors. It will also be true for providing immediate warning of

hostile missile launches—whether from within the theater or not—which threaten Objective Force units, permitting them to employ or call for appropriate missile defense systems to engage and destroy incoming missiles.

Precision position, navigation and timing data is the third space-based capability on which all elements of the future Joint Force, including Objective Force units, will rely. GPS will be the key enabler of precision fires and essential to sustaining Information Superiority on the battlefields of the 21st Century battlespace. Currently, GPS signals provide the timing reference for many of the routers which constitute the Internet and DoD's private networks, the unclassified but protected NIPRNet, the Secure Internet Protocol Router Network (SIPRNet) and the Joint Worldwide Intelligence Communications System (JWICS) network. GPS navigation is nearly as universal for commercial as well as military systems. Fixing the location of a target using GPS coordinates is the best alternative to illumination by a forward observer if precision fires are to be employed against it. Additionally, when coupled with satellite communications, GPS provides for both in-transit visibility of deploying warfighting units and systems and supporting supplies and for in-theater Blue Force tracking—another critical element of Information Superiority and total battlespace awareness. While the reliance of Objective Force units on space capabilities will vary during the different phases of an operation, space will be an integral element of an Objective Force's potency during every phase.[64]

## INFUSION OF SPACE KNOWLEDGE THROUGHOUT THE OBJECTIVE FORCE

Since "space is the key enabler to The Army for providing the most efficient, lethal forces to the JFC in any theater," the Army will need officer and non-commissioned officer (NCO) leaders who are as literate about and capable of employing space assets as they are today employing air and naval capabilities.[65] The Army will also require a cadre of space-expert soldiers—officer, warrant officer and enlisted—plus space-expert DA civilians who understand the space environment and the physics, politics and laws governing space systems and who are thoroughly conversant with all aspects of US space power—civil, commercial and military—as well as international space activities. While space capabilities are remarkable, they have some definite limitations governed by the laws of orbital dynamics. The Army's space experts will have to understand these and other unique characteristics of the space environment, be knowledgeable of US, allied, friendly, non-aligned and potential adversary space systems, and be thoroughly proficient in traditional military theory, strategy and skills and the Army's doctrine for the Objective Force. This is necessary so that they can be effective, credible representatives of the Army within the DoD, with other Executive Branch agencies and with

commercial space providers when they are serving as advocates for space systems which have the features and functionality demanded by the Objective Force. It is equally necessary so that they can fill positions on Objective Force unit staffs where they will facilitate effective incorporation of space capabilities into the operational plans and orders of their units. It will enable them to help the Army's leadership reach prudent decisions regarding how much of the Army's Total Obligation Authority each year should be invested toward developing the space capabilities required by the Objective Force.

If the Army needs space-literate civilians, soldiers, NCOs and officers, then it must establish an organizational construct to place them where they will be most effective. For space to be a seamless, integral part of the Objective Force, it is reasonable that space expertise should be organic to units that by doctrine can be employed as stand-alone forces. For the Objective Force, this means that Units of Action and Units of Employment should each have appropriate space expertise within their staff structure. Some might argue that current trends to create smaller forces and headquarters staffs and the increasing ability of information systems to permit expertise in the rear to be accessed by deployed forces militate against adding to the staffs of these units. However, if space is to be an integral element of warfighting units, the commander must have space experts available to him who are accountable to him, who understand his intent, who can frame questions and formulate space solutions which reflect his intent, and who have the comprehensive understanding of the unit's situation which is only possible by being with the unit on the ground. This is especially true when the commander needs solutions to counter an adversary's efforts to negate space capabilities, particularly should communications be concurrently disrupted—remote expertise will be of little value in such circumstances. And it is clear that potential adversaries, such as Iraq, are pursuing the means to disrupt US space capabilities.[66,67,68]

For Units of Action (UA), projected to be brigade-level organizations, it makes sense to assign an experienced Space Operations NCO in the grade of staff sergeant or sergeant first class teamed with a Space Operations officer—either a captain or a major—to each UA S3 staff. This is the way expertise is added to many brigade-level staffs today and providing the UA S3 with a Space Operations officer and experienced Space Operations NCOs should serve as a strong catalyst for properly infusing space as the fifth dimension of warfare into all UA operations and plans. Units of Employment (UE) represent the higher headquarters for several UAs and are notionally division-level organizations. Because UEs are intended to provide command and control for several UAs and because UEs clearly may be employed as the sole US land force presence within a theater, they should be assigned a team of space experts to

their staffs. Assignment of a Space Operations officer—probably a major—and two Space Operations NCOs—most likely a sergeant first class and a staff sergeant—should provide the expertise and staff support to ensure the prudent planning and integration of space capabilities into UE missions. In addition, should the UE commander be assigned the responsibility for coordinating space support of a Joint Task Force (JTF), these three soldiers would become the focal point for fulfilling that responsibility, although most likely they would request through the UE commander that they be augmented by additional Army Space Operations soldiers, most probably constituted as an ARSST.

For those occasions when the commander of a UE is assigned the responsibility as the Joint Task Force Commander, it seems reasonable to augment his normal Space Operations team with an ARSST which would be deployed from SMDC to form a Space Support Element. This cell would be led by a Space Operations lieutenant colonel with a Space Operations major and three to five Space Operations NCOs. It would fulfill the greater responsibilities of integrating and coordinating space support to a Joint Task Force, coordinating as appropriate on behalf of the JTF commander directly with the staffs of SMDC, STRATCOM and the space portions of the staff of the combatant commander in whose Area of Responsibility (AOR) the JTF is operating.

At present, the future of corps-level headquarters is uncertain. However, should corps headquarters continue into the Objective Force era, they would continue to be natural candidates for fulfilling the role of a JTF headquarters. They most likely would be responsible for commanding multiple UEs in a large operation. It therefore seems reasonable that if there are corps-level headquarters in the Objective Force, then they should have a permanent Space Support Element assigned within their G3 organization composed of a Space Operations lieutenant colonel, major and three to five NCOs. It seems probable that army headquarters will continue to exist within the Objective Force. The Army has already made a commitment to provide space expertise to its army headquarters today. Given the scope of responsibility of these headquarters, they will need the same proficiency and depth of space expertise as that proposed for corps headquarters. It therefore seems reasonable to create a permanent Space Support Element within the G3 of each Army headquarters consisting of a Space Operations lieutenant colonel, major and three to five NCOs.

In terms of higher-level organizations in the Army, one must consider what kind of space expertise should be resident with the Training and Doctrine Command (TRADOC), Army Material Command (AMC), Forces Command (FORSCOM) and the Army Staff. If space is an integral element of the Army's Objective Force, each of these organizations needs to include

some space expertise. Clearly, the TRADOC schoolhouses will require space-smart people on their staffs: DA civilian, enlisted and officer. For many purposes and to assure continuity, a DA civilian is the prudent solution to provide the schoolhouses with space expertise to assist with the integration of space capabilities into Army doctrine across all branches and to develop space familiarization training that is tailored to the area of expertise of each school. For some TRADOC facilities, the Army will be best served by the assignment of one or more Space Operations officers to work combat developments for the branch supported by that facility. These should be the branches which most leverage space capabilities and include the Combined Arms Center, the Intelligence Center, the Signal Center, the Field Artillery School, the Air Defense Artillery School and the Engineer School. Depending on the growth of the Army's space-related missions, it may make sense to assign two DA civilians to some schools—Air Defense Artillery, Field Artillery, Intelligence, Signal and Engineer—whose branches significantly depend upon space systems and which therefore must prepare officers and enlisted soldiers to integrate these capabilities effectively into the range of capabilities provided by that branch. For those schools that qualify soldiers in Military Occupational Specialties (MOSes) which are space-focused or highly space dependent, the Army should assign one to five Space Operations NCOs to serve as instructors as well as to help prepare training material and develop space-related Army doctrine. Although not a part of TRADOC, the soldiers of US Army Special Operations Command (USASOC) are especially reliant on US space capabilities and therefore a small contingent of Space Operations professionals should be assigned to ensure that these soldiers understand and effectively leverage all space capabilities.

At AMC, the focus will most likely not be in developing the space segment of space systems. Unless unique Army requirements necessitate the development of a unique Army space system, space segment development and procurement will be performed by the US Air Force. However, AMC will retain responsibility for development and procurement of the ground and control segments for a variety of space systems such as SHF wideband SATCOM control systems, satellite communications ground terminals, and GPS receivers. AMC will also be responsible for developing and procuring space control systems which the Army is assigned to prepare, field and operate. The Army and AMC should be provided opportunities to place Army Acquisition Corps officers into space acquisition positions in joint program offices which are managing the acquisition of space systems, such as Air Force Space Command's Military SATCOM (MILSATCOM) Joint Program Office (MJPO). Therefore, some space expertise at AMC will be necessary—possibly a Space Operations colonel augmented by a team of DA

civilians appropriately dispersed to those portions of AMC which have responsibility for space-related procurements.

For FORSCOM, the approach already recommended for UAs, UEs, corps and army headquarters should be modified. The FORSCOM G3 and G5 staffs should include space experts—a Space Operations colonel and lieutenant colonel or major, two Space Operations NCOs and two or three Space Operations DA civilians—to assist the FORSCOM staff to properly plan and prepare for the inclusion of space capabilities into Army operations. Space Operations experts should also be assigned to the Army's Network Enterprise Command (NETCOM) since space will be the essential enabler for establishing flexible networks with global reach in support of deploying Objective Force units. The assignment of a Space Operations colonel, lieutenant colonel, warrant officer, two Space Operations NCOs and two or three Space Operations DA civilians should prudently facilitate the synchronization of space support to NETCOM.

The Army Staff will clearly need space experts. Space Operations officers and civilians should be assigned to the Army Staff G2, G3, G6 and G8 to facilitate the building of space into the Army's total capabilities. In each case, a Space Operations colonel should lead the team of Space Operations soldiers in these four staff elements. The role of these teams will not only be to help incorporate space into Army doctrine, plans and systems, but also to serve as advisors to the Army leadership as decisions about how to invest the Army budget and how to structure and equip the Objective Force are made. Additionally, often in conjunction with the appropriate Space Operations soldiers from SMDC or assigned to TRADOC and AMC, these Army Staff space experts will have the responsibility—either personally or by having thoroughly prepared their staff principal—to articulate and champion Army requirements for space systems within the joint community, with other Executive Branch agencies and with the Congress. Furthermore, since the Army recognizes that space is a critical enabler for the Objective Force, it should consider tasking an Assistant Secretary to focus on space and its infusion into the Army. If an Assistant Secretary were to be designated to fulfill this role, he would be an exceptional champion for the Army's requirements for space capabilities.

## FULFILLING THE ARMY'S JOINT SPACE RESPONSIBILITIES

The Army will need to provide Space Operations soldiers—primarily officers—to fill positions at STRATCOM, Joint Forces Command (JFCOM) and Northern Command (NORTHCOM). It will continue to provide Space Operations soldiers to the North American Aerospace Defense Command (NORAD). It will also need to provide Space Operations

soldiers to work in positions at Naval and Air Force space-oriented units, the Joint Staff, Defense agencies and OSD. Assignment of Army space experts to joint organizations will convey the Army's commitment to space and will help to ensure that joint perspectives and requirements are addressed in all space systems. At STRATCOM, it will be appropriate to assign one or two Space Operations colonels—one in the J3 and possibly a second in the J5 offices. It will also be appropriate to assign two to three lieutenant colonels and five or six majors in these same offices and in other organizations coordinating joint capabilities to which the Army contributes; e.g., in the future, space control capabilities. The Army will want to assign a small contingent of Space Operations officers, probably a lieutenant colonel in the J3 office and a colonel and lieutenant colonel in the J5 office, to help JFCOM include Army space requirements and capabilities as it develops joint warfighting doctrine, exercises and requirements. The Army already has made a significant commitment of space experts to NORTHCOM and NORAD; it will want to continue this commitment and involvement in contributing to the defense of the Homeland. Similarly, the Army will want to assign at least three officers, perhaps a major, a lieutenant colonel and a colonel, to various offices within the Joint Staff that deal with space capabilities to ensure that the Army's contributions are fully understood and that the Army is recognized as a full partner within the Nation's joint space team.

The Army will want to affirm its cooperation with Naval Network and Space Operations Command by assigning two to six of its Space Operations professionals to work in liaison positions with this Command. Even more critical will be assigning Army Space experts to work within the various elements of Air Force Space Command (AFSPC) given the Executive Agent responsibilities for space it now fulfills for all of DoD.[69] To effectively facilitate AFSPC in developing and fielding space systems which meet Army as well as Naval and Air Force requirements, the Army should plan on assigning two to three dozen of its space experts to positions within AFSPC. The Army should continue to assign small numbers of officers to work with OSD staff elements overseeing space and to work on the staffs of Defense agencies which execute joint space responsibilities, including the Assistant Secretary of Defense for Command, Control, Communications and Intelligence (ASD(C3I)), the National Security Space Architect (NSSA), the National Reconnaissance Office (NRO) the National Imagery and Mapping Agency (NIMA) and the Defense Information Systems Agency (DISA). The 2000 Space Commission recommended such an approach to the Army and Navy in its 2001 report.[70] The current complement of two dozen soldiers who are assigned to the Army element of the NRO serves as

an example and as a validation of this recommended approach. It is also an indicator of the commitment the Army should make to establish a similar presence within AFSPC.

## THE ARMY'S OPERATIONAL SPACE FORCES

The nexus of operational space capabilities within the Army should continue to be SMDC. It is through SMDC and its subordinate US Army Space Command that the Army will continue to fulfill its responsibility to provide component forces to STRATCOM. SMDC contains the Army's current operational space forces; it is the natural command within which to expand the Army's space capabilities. As the space literacy of Army officers grows and as the Army's cadre of Space Operations soldiers and civilians grows, SMDC's general officer leadership should increasingly be experienced and proficient in space operations before being assigned to fill SMDC's senior leadership positions. Increasing expertise will result in increasing recognition of SMDC and its leaders as credible spokespersons on behalf of the Army's requirements for space capabilities and increasing recognition of the Army's ability to contribute to the Nation's space power. Consistent with its role as a component to STRATCOM—a unified command with multiple global responsibilities and missions—SMDC will establish itself as an organization with robust capabilities and global reach. This approach will permit the Army to develop a diverse range of space capabilities that contribute to STRATCOM mission accomplishment and permit the Army to obtain the maximum benefit of space capabilities for the Objective Force in achieving Joint Vision 2020.

Objective Force units will not need to have *space units* habitually assigned to them but will be able to employ additional Army space expertise and capabilities as the situation warrants. The Army can continue to benefit from SMDC's current economy of force approach: providing centralized expertise and operationally-focused units that deploy small teams to augment maneuver units as the foundation of Army space capabilities. The current evolution of SMDC's operational space forces into traditional Army units—companies and battalions and, at some future point, an Army Space Brigade—must continue; soldiers understand companies, battalions and brigades and recognize that they bring warfighting ability and combat effectiveness to a mission. Much of SMDC's space expertise will continue to be centralized; however, its operational focus must be clear and its operational forces organized based upon the standard unit construct of the Army. Based on current and likely Army space capabilities, SMDC should build a Space Brigade comprised of three types of battalions: force enhancement, space support and space control.

Although, since the early 1960s, the Army has neither embraced nor advocated an active role for itself in developing and operating systems that operate in space, there is no absolute basis for such a stance. While the Air Force tends to view space as an extension of the earth's atmosphere and while the other services have tended to yield their interests in space systems in deference to the Air Force's initiative in and enthusiasm for exploiting space, space is fundamentally a different environment and a different medium than the air.[71] The Army, the Navy and the Marines can present equally sound cases and demonstrate equally proficient capabilities for exploiting space as the Air Force, if they choose to allocate the resources and effort to develop, field, operate and maintain the requisite systems.

US interests and national security will be well served if the Army explores options to develop, field, operate and maintain systems that provide space control capabilities. Given the importance of space to the Objective Force and the benefits of warfighting capabilities which are responsive and accountable to battlefield commanders, it may well develop that SMDC and the Army should consider creation of a fourth type of battalion—devoted to the application of force from space. In today's context, such a proposition is radical. However, although premature to call for the Army to plan to allocate force structure to the space force application mission area, creation of Army units which can attack an adversary's systems from or through space in response to the requirements of maneuver forces may yet prove to be effective, practical and necessary.

Of the types of battalions which the Army should begin to develop, two battalions of the force enhancement type already exist. The first is designated as the 1st Space Battalion and it has two primary missions: staffing, training and equipping Army Space Support Teams and Joint Tactical Ground Station units. The second, designated as the 193d Space Support Battalion, is a Colorado National Guard unit with one mission area: staffing, training and equipping ARSSTs. The 193d Space Support Battalion provides the ability to leverage the civilian space experience and expertise of National Guard soldiers and demonstrates that all components of the Army not only use but also contribute to the exploitation of space. The ARSSTs remain organic to SMDC but are dispatched in direct support of deploying Army units—in the future, to UEs and possibly UAs—and, if requested, to JTFs and are the principal means by which SMDC provides focused, expert space force enhancement capabilities to Army warfighters. The ARSSTs have the capability of assisting with space-based PNT, providing space-based weather forecasting, mapping products, terrain analysis and geodetic data, obtaining ISR from existing US orbital national assets and furnishing satellite communications. For the present, the minimum number of ARSSTs which SMDC should maintain is ten: enough

to have five or six ARSSTs deployed concurrently and have the ability to relieve them with another should the circumstances demanding their deployment continue for a period exceeding six months. In the future, however, it may be appropriate to create additional ARSSTs in order to have a habitual association between an ARSST and the designated UE which it supports—recognizing the potential evolution to a Space Support Element as an intrinsic part of a UE. The JTAGS units—staffed in part by sailors from the Naval Network and Space Operations Command—are deployable as are the ARSSTs and provide warning of missile launches to US forces in a theater of operations.[72] They can be dispatched to wherever Army or Joint Forces require this missile warning capability. The JTAGS units are small and effective—SMDC should continue to operate a minimum of five JTAGS units as part of its 1st Space Battalion, permitting two JTAGS to be deployed into one theater if necessary.

The space support type of battalion also exists today; the single battalion of this type is designated as the 1st Satellite Control Battalion and it is responsible for payload control and back-up satellite platform control of DoD's wideband communications satellites. SMDC should continue and consider expanding upon this battalion as it is currently the sole Army unit executing a mission in the space support area. Due to the importance of satellite communications to the operational concepts for the Objective Force, this is a potential growth area for SMDC and for the Army. First, there is a continuing possibility to migrate control of military use of commercial SATCOM into 1st SATCON Battalion's facilities. Doing so presents a tremendous benefit to the warfighter: as presently conceived, a soldier, sailor, marine or airman operating a multi-band SATCOM terminal at the end of this decade will have to work with two to four or more different control facilities depending on which DoD satellites and which commercial vendors are providing SATCOM to his terminal. A single set of military-run, integrated control facilities would provide simplicity, clarity and unity of effort. Second, there are other possibilities for expanded Army participation in the control of satellites. The Army could renew its former participation in flying the GPS constellation by having soldiers assigned to the 1st SATCON Battalion again work as members of the Air Force's 2nd Space Operations Squadron which controls the GPS spacecraft. While not essential, such participation would present an additional professional development opportunity for Space Operations soldiers that is clearly tied to a system the Army will use as much as it does wideband satellite communications. And as future space systems are defined and developed in a joint environment, there may be other logical, beneficial opportunities for Army Space operators to participate in the control of ISR, weather and imaging-geodetic satellite systems.

The space control type of battalion does not exist today but, in the future, as space control becomes an active mission area and as the Army's capabilities mature, it seems likely that the Army will task SMDC to form a Space Control Battalion. SMDC would organize into this battalion the capabilities it provides to STRATCOM and the Nation for assuring US access to space and space systems while, if necessary, denying hostile nations or organizations the equivalent access. Such a battalion could certainly provide Army systems designed to jam orbiting satellites organized into a jamming company. Another company could be structured to provide the Army's contribution to monitoring on-orbit space systems from ground-based sensors. Possibly, a third company would be structured to provide kinetic energy anti-satellite systems, should OSD approve the development and use of such systems at a future time. Formulation of a company organized to provide directed energy (microwave, laser, and/or particle beam) disruption of satellite systems would round out this battalion—providing a variety of responsive capabilities with which to defend US space superiority without the need to pre-position the systems it operates in orbit.

SMDC will also continue to play a critical enabling role for STRATCOM in executing STRATCOM's responsibility as the DoD's SATCOM Operational Manager (SOM). First and foremost, SMDC will continue to fulfill its role as the executive agent for the operation of the Regional SATCOM Support Centers, organizations which the Army created and which are now the focal points for planning all SATCOM support to US warfighters. In addition to the three RSSCs established to date, SMDC in conjunction with STRATCOM should consider creating an in-theater RSSC for US Central Command (CENTCOM) to operate in conjunction with the Defense Information System Agency's in-theater Regional Network Operations and Security Center (RNOSC)—the existing RSSCs operate in conjunction with DISA's other RNOSCs, so it may make sense to create a fourth RSSC to support CENTCOM.

SMDC should formalize its existing space intelligence capabilities into a Global Space Intelligence Analysis Center as part of its Army Space Command in Colorado Springs. This center should serve as a focal point for monitoring Army-collected space intelligence and as the Army's focal point for the integration of space intelligence collected by the Army, by the joint community and by national systems. It would also support the integration of space-related intelligence by STRATCOM. It would be the single point for the Army for assessing the ramifications of all-source space intelligence on Army forces and preparing a continuously updated global space intelligence preparation of the battlefield, or global space IPB. The Space IPB would include information such as satellite overpass notices (SATRANS notices) and adversary space order of battle information. The global Space IPB and the staff of Army space

intelligence experts who prepare it would be available via secure connectivity, such as the Global Command and Control System (GCCS), SIPRNet and JWICS, to Army Space Operations officers, Space Support Elements and ARSSTs. This secure availability would provide the Army's space experts assigned throughout the Objective Force with access to centralized intelligence expertise for assistance in preparing the Space IPB relevant to the units they are supporting. The Space Intelligence Center would also provide assistance with Blue Force tracking and threat awareness.

To capitalize on existing synergies and be consistent with the 2001 Space Commission recommendation that "consolidating space functions into a single organization would create a strong center of advocacy for space and an environment in which to develop a cadre of space professionals" who "should be chartered with developing doctrine, concepts of operations and new [space] systems," SMDC should continue to operate its Force Development Integration Center. [73] This will continue the benefits of having a small number of space experts identify and explore ways in which space can serve as a force multiplier for all elements of the Army. SMDC's current organization and responsibilities provide an opportunity for Space Operations officers to develop space expertise, to help develop concepts and doctrine for employing space into Army operations, and to apply their knowledge in support of maneuver units. The responsibilities and structure of SMDC conform very closely with the kind of organization for space which the 2000 Space Commission recommended the military services form.

## DEVELOPING THE ARMY'S SPACE EXPERTISE

### THE EXPERTS NEEDED

To properly staff the organizations as outlined above, the Army will need an appropriately-sized corps of space experts: officer, warrant, NCO, enlisted and DA civilian. Table 2 presents a qualitative assessment, based on the foregoing discussion, of the space experts the Army will require and where they should be allocated in order to appropriately embed space capabilities throughout the Objective Force. It is indicative rather than definitive.

The evident magnitude of space experts required by the Army does not compel the creation of a new branch. Clearly, there are space-related MOSes which exist today that could be brought together with the existing Space Operations officer functional area. Together, these could be coupled with the proposal in this paper to expand Space Operations to include warrant officers, NCOs and DA civilians in order to form a branch. But forming a branch is not necessary for the Army to effectively grow the space experts it requires and properly assign

them throughout its force structure. What is required is that the Army develop the requisite cadre of space experts using the means it deems most efficacious.

## ROLES OF THE ARMY'S SPACE EXPERTS

The officers, warrant officers, NCOs, enlisted soldiers and DA civilians who serve as space experts and operators must be able to operate as seamless members of UA and UE staffs. They must have sufficient understanding of space capabilities and the space environment to be able to continue to provide the benefits of space exploitation to maneuver commanders even in the absence of some or all automated space planning tools and decision aids. The primary goal for Army space professionals is and will remain to ensure that the Army can effectively incorporate the benefits of space capabilities and space power in planning for and executing any and all missions it is assigned.

| | SMDC | ARSPACE | Space Bde | Space Bn | Space Spt Bn | SATCON Bn | Space Cntl Bn | Army Staff | Joint Staff | Unified Com-mands | Navy & USAF Units | OSD/ Defense Agencies | MACOM Staffs | USASOC | TOTALS | *Multiply by number of each:* UA | UE | Corps | Army |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **Officer** | | | | | | | | | | | | | | | | | | | |
| O9 | 1 | | | | | | | | | 0 | | 0 | 0 | | 1 | | | | |
| O8 | 1 | | | | | | | | | 0 | | 0 | 0 | | 1 | | | | |
| O7 | | 1 | | | | | | | | 0 | | 0 | 0 | | 1 | | | | |
| O6 | 6 | 3 | 1 | | | | | 4 | 1 | 5 | 11 | 7 | 6 | | 44 | | | | |
| O5 | 9 | 5 | 2 | 1 | 1 | 1 | 1 | 2 | 1 | 9 | 16 | 12 | 5 | 1 | 66 | | | 1 | 1 |
| O4 | 12 | 10 | 5 | 2 | 2 | 2 | 2 | 2 | 1 | 12 | 23 | 24 | 7 | 1 | 105 | 1 | 1 | 1 | 1 |
| | | | | | | | | | | | | | | | **218** | **1** | **1** | **2** | **2** |
| **Warrant Officer** | | | | | | | | | | | | | | | | | | | |
| W5 | 1 | | | | | | | | | 0 | 1 | 1 | 0 | | 3 | | | | |
| W4 | 3 | | | | | | | | | 2 | 4 | 2 | 0 | | 11 | | | | |
| W3 | | 2 | 2 | | | | | | | 2 | 2 | 4 | 6 | 1 | 18 | | | | |
| W2 | | | | 3 | 2 | 3 | 1 | | | 0 | | 0 | 0 | | 9 | | | | |
| W1 | | | | 3 | 2 | 3 | 2 | | | 0 | | 0 | 0 | | 10 | | | | |
| | | | | | | | | | | 0 | | 0 | | | **51** | | | | |
| **NCO** | | | | | | | | | | | | | | | | | | | |
| E9 | 1 | | 1 | 1 | 1 | 1 | 1 | | | 0 | | 0 | 1 | | 7 | | | | |
| E8 | 3 | 1 | 1 | 10 | 6 | 6 | 3 | | | 1 | 3 | 4 | 5 | 1 | 43 | | | | |
| E7 | 4 | 3 | 3 | 10 | 6 | | 9 | | | 2 | 5 | 5 | 15 | 3 | 62 | 1 | 1 | 2 | 2 |
| E6 | 4 | 4 | 10 | 20 | 12 | | 20 | | | 0 | | 8 | 18 | 1 | 96 | | 1 | 3 | 3 |
| E5 | | | | | | | | | | 0 | | 0 | 0 | | 0 | | | | |
| E4 | | | | | | | | | | 0 | | 0 | 0 | | 0 | | | | |
| | | | | | | | | | | | | | | | **208** | **1** | **2** | **5** | **5** |
| **DA Civilian** | | | | | | | | | | | | | | | | | | | |
| GS15 | 5 | 3 | | | | | | | | | | 1 | 1 | | 10 | | | | |
| GS14 | 9 | 4 | 2 | | | | | 2 | | | | 5 | 6 | | 28 | | | | |
| GS13 | 9 | 7 | 4 | 1 | | | | 2 | | | | 6 | 13 | 1 | 42 | | | | |
| GS12 | 2 | 7 | 6 | 2 | | 2 | 2 | | | | | 3 | 18 | 2 | 42 | | | | |
| GS11 | 3 | 8 | 2 | | | 6 | 4 | | | | | 0 | 0 | | 23 | | | | |
| | | | | | | | | | | | | | | | **145** | | | | |
| | | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | **Total** | **622** | **2** | **3** | **7** | **7** |
| | | | | | | | | | | | | | | | *Multiplier:* | TBD | TBD | TBD | TBD |
| | | | | | | | | | | | | | | | | TBD | TBD | TBD | TBD |

**Total Force:** 622 + approximately 178 = **800**

TABLE 2. ASSESSMENT OF SPACE OPERATIONS BILLET REQUIREMENTS

More broadly, the Army must also develop a degree of space literacy throughout its leaders that is equivalent to their air and sea literacy: all Army leaders must be aware of space capabilities and systems and be comfortable in integrating space capabilities into the operational planning and execution of UA, UE and higher level organizations. UA and higher level units should routinely explicitly incorporate space systems, capabilities and products into

their operations plans and orders using Annex N, the doctrinally-designated Army and Joint annex for addressing space's contributions to a battle plan.[74]

From its Space Operations officers, the Army will need warfighters who are equally proficient in space and warfighting skills. Although a Space Operations career field does not yet exist for warrant officers, space would seem to be a natural arena for which the Army will build warrant officer expertise: warrants are typically employed by the Army to serve as its pool of technical practitioners in selected areas of expertise. While it is unlikely that Space Operations warrant officers will represent a significant portion of the force over the next 20 to 30 years, the space support and space control mission areas are excellent candidates for creating a small number of warrant officer development positions. For space support, creating a payload warrant officer position focused on satellite payload and possibly bus control in each of the 1st SATCON Battalion's companies for a total of six positions would be very beneficial both for mission accomplishment and developing the proficiency of Space Operations warrants, especially if the breadth of the 1st SATCON Battalion's mission grows. Space control is another likely area for five to six warrant officer positions as negation of adversary space capabilities and defense of US and friendly (military, other government or commercial) space capabilities will require a thorough understanding of the space environment, orbital dynamics and the systems being operated to achieve space control.

If space is to become a routine element of the Army's warfighting capabilities, then the Army will have to have Space Operations NCOs. The Army relies on its NCOs to oversee the detailed execution of every combat and combat support skill set it possesses—space should be no different. Most likely, there will not be Space Operations soldiers at the rank of specialist and below and perhaps not at the rank of sergeant. However, there will be space-related MOSes such as today's satellite controllers (MOS 31S1C) and tomorrow's space control system operators into which young solders will be accessed. The Army will incorporate extensive education and training on the space environment, orbital dynamics and space systems into the Advanced Individual Training (AIT) and other MOS-specific training provided to these soldiers. They will therefore make excellent candidates to become Space Operations NCOs as they are promoted to the rank of staff sergeant.

As it will need Space Operations NCOs and selected space-skilled junior soldiers, the Army will also need to develop a portion of its civilian workforce as space operations professionals. DA civilians fulfill important roles in every functional area of the Army: space is and will be no different. This is evidenced today within SMDC where DA civilians already fill jobs in which they contribute to every facet of SMDC's space responsibilities. The challenge to

the Army for developing its Space Operations civilians is that historically the Army has not provided as well-structured professional development programs for its civilians as for its uniformed members. However, as it embraces space power, the Army should give careful consideration to affording its emergent civilian space professionals with the same or similar education and training opportunities as it provides its uniformed space experts.

## EDUCATING AND TRAINING THE ARMY'S SPACE EXPERTS

The Army will need to ensure that its cadre of space experts is provided appropriate training and education opportunities to develop their familiarity with the space environment; space technology; US space policy, strategy, systems and capabilities; and the space policy, strategy, systems and capabilities of other nations and commercial operators. This will equip them to be space as well as warfighting professionals who will be able to effectively and credibly represent Army requirements for space capabilities to the Army's senior leadership, to the other Services, to the Joint Staff, to OSD, to other Executive Branch agencies and to the Congress. To prepare its space experts with the appropriate education and training, the Army need not develop a plethora of its own space education and training programs or institutions. As previously discussed, for the Army, space is a force multiplier that has not and should not require tremendous investment of force structure to achieve. The Army needs a relatively small cadre of space operations experts in order to properly incorporate the benefits of US space prowess into its warfighting capabilities. It does not need to establish a new TRADOC school to educate and train them.

Instead, for the most part, it can and should leverage existing and future space education and training which the Air Force and Navy offer and which it can obtain from elsewhere within the Executive Branch (e.g., NASA), academia and industry. When officers, NCOs and civilians are initially selected to become Army space operations professionals, the Army should provide them a basic-level education in the space environment, orbital dynamics and space systems to develop in each a basic knowledge of space. The Army should also provide initial orientation training in US space systems, capabilities and products and how Army maneuver units—especially UAs and UEs—can employ them in executing operations assigned to the Army. Today, this initial foundation is provided by the SMDC-conducted Space Operations Officer Qualification Course, a course that should be continued into the future and be expanded in an appropriate manner to include DA civilians, warrant officers and NCOs as the Army's Space Operations cadre grows and matures.

The Army should begin to incorporate space into its advanced civil schooling and Senior Service College Fellowship programs and provide a selected subset of Space Operations officers the opportunity to obtain advanced (masters or Ph.D) degrees in space subjects to enhance the space-focused knowledge within its Space Operations cadre. It is already exploiting the Training With Industry program to take advantage of learning opportunities afforded by the commercial firms dealing in space—this program should be continued given the current and projected continued use by the military of commercial space systems. Similar opportunities should be provided to promising DA civilians to promote a high degree of space knowledge within the civilian segment of the Army's Space experts. Space Operations soldiers and civilians should be provided the opportunity to attend Air Force and Navy-conducted space training programs such as the relevant courses offered by the Air Education Training Command (AETC) and the Naval Post Graduate School's space-oriented degree programs which will give them knowledge, expertise and/or skills in space systems which will improve their ability to assist the Army in exploiting space.

As the Army adds NCOs and warrant officers to its space experts, a Space Operations Qualification Course tailored to building the foundational space operations knowledge they need to serve in the Space Operations role should be developed for them, most likely as a modification of the Space Operations Officer Qualification Course. The addition of NCOs and warrant officers into the family of the Army's Space Operations personnel will necessitate that the Army and TRADOC consider implementing a Basic NCO Course (BNCOC), an Advanced NCO Course (ANCOC) and a series of warrant officer courses which are focused on Space Operations. While the conduct of such space-focused training most likely will be prudent, the Army need not create a new TRADOC school for its conduct. Instead, the appropriate training can be provided at an existing TRADOC school which is designated to host it; natural candidates include the Artillery School, the Air Defense Artillery School, the Intelligence School or the Signal School—all of which either today or in the future will be involved in training soldiers in space-related MOSes. Additionally, the Army should take advantage of its reserve component soldiers who have space knowledge, experience and expertise which they've gained from their civilian-sector jobs and employ them to help develop and present the space training which the Army decides it will conduct.

## CREATING SPACE-LITERATE ARMY LEADERS

While no new TRADOC school for space is required, as indicated earlier, TRADOC will have to undertake the responsibility to provide all NCOs and officers with expanded space

familiarization training. Army Space Operations personnel assigned to TRADOC will be significant contributors to the development of this training. The program of instruction for this training must be designed to give senior enlisted and commissioned leaders the same level of proficiency in incorporating space capabilities into Army operations as they currently possess in incorporating air and sea capabilities. As stated in one background paper submitted to the 2000 Space Commission, "Commanders would be better able to exploit the full range of combat capability at their disposal if they were educated from the beginning of their careers in the application of space systems."[75] TRADOC must improve the education and training provided to Army leaders. For NCOs, space familiarization training should be provided at the Sergeants Major Academy and at ANCOC. For NCOs in selected MOSes that operate and employ space systems, training in how space systems are integrated into the rest of the Army's capabilities should be incorporated into the program of instruction provided to them at BNCOC and ANCOC. The earliest familiarization with space which most officers will require should be during the Combined Arms and Staff Services School—unless they will be involved directly in employing or operating space systems as company grade officers, the officer basic and career courses will not need to provide space familiarity. While the Command and General Staff College and Army War College have begun to address familiarization with space, their curricula must provide a more thorough immersion in the space environment and space capabilities. Future Army field grade and general officers must be as ready to incorporate space power into their operations as they are sea and air power.

**ASSESSMENT AND RECOMMENDATIONS**

It appears that the Army has made many of the decisions it should to ensure it can effectively exploit the benefits of US capabilities in space. In the 1990s, it created its Space and Missile Defense Command to serve as its component to what today is USSTRATCOM. SMDC consolidates most space-related functions for the Army within one command, facilitating the development of space professionals as the 2000 Space Commission recommended. The Army is recognizing the need to emplace space expertise throughout its maneuver forces. Its Transformation Roadmap states that in the far-term, Objective Force organizations will have "a permanent staff of Space Operations Officers."[76] The Roadmap only calls, however, for Space Operations officers to be assigned to numbered armies and corps in the near-term.[77] The Objective Force in 2015 White Paper indicates that Space Operations officers "will be assigned to the UE to assist commanders and staffs to fully integrate and synchronize space-based information and capabilities into their operations across the full spectrum of conflict."[78] SMDC's

own FDIC has indicated that in the far-term, "a robust space element will be present in the Corps and Divisions designated as ARFOR HQs [UEs] and that an officer designated for FA-40 training will be assigned to each BCT [UA]."[79] However, it would be prudent to assign an experienced Space Operations NCO as well as a newly designated Space Operations officer to a UA. UAs will have to operate highly independently on future battlefields and may well be the only Army element in some future operations. Therefore they should have an organic ability to understand and employ space systems that is firmly grounded in experience applying those systems to the demands of warfighting.

The Army has begun developing a corps of space experts: its Functional Area 40 – Space Operations officers. However, as an institution, the Army today has no clear plan to formally broaden space expertise to include warrant officers, NCOs and DA civilians. In particular, the absence of a plan to grow an appropriate cadre of Space Operations NCO seems shortsighted. As discussed earlier, NCOs are the backbone of the Army. If space is to become a routine element of Army operations, then NCOs should be involved in infusing space capabilities into Army operations. Space is not so challenging or esoteric that NCOs cannot handle it. NCOs have successfully overseen payload control of the Defense Satellite Communications System for two decades. Some of these satellite controller NCOs were sent to attend DSCS III Crew Commander Initial Qualification Training conducted by the Air Force's AETC during the mid-1990s; all of them graduated in the upper half of their classes which were primarily composed of Air Force officers.[80,81] There is no reason the Army should not evolve a corps of space experts that includes NCOs and warrant officers as well as commissioned officers. The Army must also view many of the DA civilians it needs in its space forces as among its space experts—and provide them with appropriate educational, training and professional development opportunities.

The beginnings of a sound approach to educating and training the Army's space experts exist today. However, if the Army's cadre of space experts grows in a manner consistent with this paper's proposals, the Army will have to develop an approach to broaden the space instruction it makes available to them. The Army Transformation Roadmap asserts that "an aggressive educational program supported by published doctrine articulating the role, capabilities and employment of space-based assets will embed space into the Army's education system" in order to ensure that all officers "receive a fundamental knowledge of space operations and systems."[82] As the Army builds space training throughout its officer, warrant officer and NCO education systems, it should employ as course developers and instructors those reserve component soldiers who have space knowledge, experience and expertise

gained from their civilian-sector jobs. Additionally, it can and should leverage existing space education and training which are provided by the other military services, by other Executive Branch agencies, by academia and by industry when it comes to developing its cadre of space experts. While some training, such as the current Space Operations Officer Qualification Course offered by SMDC does and will make sense for the Army to conduct, the Army should concentrate on making effective use of existing programs to educate its space professionals—just as, for the most part, it will rely on joint, other service, civil, or commercial space systems to provide it with the space capabilities required by the Objective Force.

**CONCLUSION**

When assessing its evolving space capabilities, the Army is largely on-track for today and for the future Objective Force. The Army has a credible, well-organized space organization, SMDC, which is making progress in establishing operational units that provide the benefits of space exploitation to the Army and the Joint Force. It has a small, initial cadre of space experts. It has a clear understanding of the benefits and criticality of space to the Objective Force. It is planning to place space experts into the Units of Employment of the Objective Force. This placement will facilitate incorporating space capabilities into Army operations just as sea and air capabilities are incorporated today.

However, at present, it does not have a clear plan for bringing NCOs, DA civilians and warrant officers into its corps of space experts. Nor does the Army plan to introduce experienced space experts into the staffs of the future Units of Action. The Army should evaluate the two proposals offered within this paper. The first is that the Army expand the Space Operations designation to create space-expert NCOs, DA civilians and warrant officers. The second is that it place two space experts, at least one with experience applying space to Army operations, into the staffs of the Units of Action. In light of such an evaluation, the Army may well conclude that it should implement these recommendations.

WORD COUNT = 14,272

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[64] US Army Training and Doctrine Command (TRADOC), "The United States Army Concept for Space Operations in Support of the Objective Force, TRADOC Pamphlet 525-3-14," briefing slides with scripted commentary, slides 41 – 50, including speaker notes.

[65] Department of the Army, Transformation Roadmap, E-1.

[66] Commission to Assess United States National Security Space and Management Organization, 19-20.

[67] Reuters News Service, "U.S. Fears Iraq May Try to Jam GPS Signals," Houston Chronicle (Houston, TX: Houston Chronicle, November 27, 2002); available from <http://www.chron.com/cs/CDA/story.hts/world/1680068>, Internet, accessed 21 January 2003.

[68] Brett Baier and Molly Henneberg, "Iraq May Have Devices to Throw Off U.S. Smart Bombs," Fox News (Washington, D.C.: Fox News, January 11, 2003); available from <http://www.foxnews.com/story/0,2933,75187,00.html>, Internet, accessed 21 January 2003.

[69] Secretary of Defense Donald Rumsfeld, Letter to Senator John Warner, Chairman of the Senate Armed Services Committee, Washington, D.C., 8 May 2001, 2.

[70] Commission to Assess United States National Security Space and Management Organization, 92.

[71] Oberg, 126-127.

[72] Naval Network and Space Operations Command, "Naval Network and Space Operations Command Detachment Echo," no date posted; available from <http://www.nnsco.navy.mil/organization/detecho.htm>; Internet; accessed 11 December 2002.

[73] Commission to Assess United States National Security Space and Management Organization, 90.

[74] Joint Staff, Joint Doctrine for Space Operations, V-2.

[75] LtCol Kevin McLaughlin, Military Space Culture (Washington, D.C.: Commission to Assess United States National Security Space and Management Organization, Fall 2000), 34.

[76] Department of the Army, Transformation Roadmap, E-3.

[77] Ibid, E-2.

[78] Objective Force Task Force, 12.

[79] U.S. Army Space and Missile Defense Command Force Development Integration Center, Draft Space Support to the Army Transformation Force Organizational and Operational Concept (Alexandria, VA: Headquarters, SMDC, undated); available from <http://www.smdc.army.mil/FDIC/Docs/00217SpaceO_ODraft.doc>, Internet, accessed 31 October 2002), 12.

[80] Soldiers assigned to the 1st SATCON Bn attended USAF Undergraduate Space Training in 1995 – 1999. The author served as the Executive Officer and Commander of the 1st SATCON Bn in 1995 and 1996 and therefore has personal knowledge of the success many of

these soldiers achieved while attending the training which was documented and reported at the time during Quarterly Training Briefings.

[81] Air Education and Training Command, AETC Commander's Award Certificate awarded to Specialist Daniel P. Carlton in recognition as top graduate for superior academic achievement (Vandenburg AFB, CA; 381st Training Group, 11 September 1997).

[82] Department of the Army, Transformation Roadmap, E-3.

## GLOSSARY

| | |
|---|---|
| 2000 Space Commission | 2000 Commission to Assess United States National Security Space and Management Organization |
| AETC | Air Education and Training Command |
| AFSPC | Air Force Space Command |
| AIT | Advanced Individual Training |
| ALCOR | ARPA Lincoln C-band Observable Radar |
| ALTAIR | ARPA Long-Range Tracking and Identification Radar |
| AMC | US Army's Army Material Command |
| ANCOC | Advanced NCO Course |
| AOR | Area of Responsibility |
| ARFOR | Army Force |
| ARFOR HQS | Army Force Headquarters |
| Army Staff G2 | Staff section of the Army Staff responsible for Intelligence oversight and planning for the Army |
| Army Staff G3 | Staff section of the Army Staff responsible for planning and oversight of Army execution of assigned missions |
| Army Staff G6 | Staff section of the Army Staff responsible for planning and oversight of information systems and information technology support of US Army forces |
| Army Staff G8 | Staff section of the Army Staff responsible for resource management for the Army |
| ARPA | Advance Research Projects Agency |
| ARSPACE | Army Space Command |
| ARSST | Army Space Support Team |
| ASAT | Anti-Satellite |
| ASD($C^3I$) | Assistant Secretary of Defense for Command, Control and Communications and Intelligence |
| BCT | Brigade Combat Team |
| Blue Force | US or allied [friendly] forces |
| Bn | Battalion |
| BNCOC | Basic NCO Course |
| CONUS | Continental United States |
| CENTCOM | US Central Command, a unified combatant command of the US with responsibility for activities conducted by the US military throughout the Middle East |
| DA | Department of the Army |

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|---|---|
| DA civilian | Department of the Army civilian employee |
| DISA | Defense Information Systems Agency |
| DoD | US Department of Defense |
| DSCS | Defense Satellite Communications System |
| EHF | Extremely High Frequency portion of the electromagnetic spectrum; used for SATCOM |
| Eutelsat | European Telecommunications Satellite—a European satellite communications consortium |
| ESA | European Space Agency |
| FDIC | US Army SMDC's Force Development Integration Center |
| FORSCOM | US Army Forces Command |
| G3 | The operations section of the staff of an Army unit commanded by a general officer |
| G5 | The planning section of the staff of an Army unit commanded by a general officer |
| Galileo | A proposed European satellite-based global navigation system similar to the US GPS |
| GCCS | Global Command and Control System |
| GLONASS | Global Navigation Satellite System, a Soviet-developed, now Russian-operated satellite-based global navigation system similar to the US GPS |
| GPS | Global Positioning System, a US satellite-based global navigation system based on a minimum of 24 satellites in medium earth orbits (about 13,800 km high) |
| Grenadier Brat | Position detection using GPS and reporting via radio transmission system used to track the location of Blue Forces |
| HQS | Headquarters |
| INMARSAT | International Maritime Satellite—a global, international satellite communications consortium initially focused on commercial maritime customers |
| Intelsat | International Telecommunications Satellite—a global, international satellite communications consortium |
| IPB | Intelligence Preparation of the Battlefield |
| ISR | Intelligence, Surveillance and Reconnaissance |
| JFC | Joint Force Commander |
| JFCOM | Joint Forces Command |
| JOA | Joint Operations Area |

| | |
|---|---|
| JSST | Joint Space Support Team |
| JTAGS | Joint Tactical Ground Station |
| JTF | Joint Task Force |
| JWICS | DoD's Joint Worldwide Intelligence Communications System, a secure virtual private network using Internet Protocol routing |
| KE-ASAT | Kinetic Energy Anti-Satellite |
| LANDSAT | Land Satellite |
| MACOM | Major Command of the US Army; e.g., Forces Command and Training and Doctrine Command |
| MILSATCOM | Military Satellite Communications |
| MJPO | MILSATCOM Joint Program Office |
| MOS | Military Occupational Specialty |
| NASA | National Aeronautics and Space Administration |
| NCO | Non-Commissioned Officer, a.k.a., generically, "sergeant" |
| NETCOM | US Army's Network Enterprise Technology Command |
| NGO | Non-Governmental Organization |
| NIMA | National Imagery and Mapping Agency |
| NIPRNet | DoD's protected but unclassified virtual private network using Internet Protocol routing |
| NORAD | North American Aerospace Defense Command |
| NORTHCOM | US Northern Command, a unified combatant command of the US with responsibility for activities conducted by the US military in support of the defense of the Homeland |
| NNSOC | US Navy's Naval Network and Space Operations Command |
| NRO | National Reconnaissance Office |
| NSSA | National Security Space Architect |
| OEF | Operation Enduring Freedom |
| OmniTRACS | A commercial position detection using GPS and reporting via commercial SATCOM system propriety to Qualcom; used by US Army forces in Bosnia and Kosovo to track the location of Blue Forces |
| ops | operations |
| OSD | Office of the Secretary of Defense |

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|---|---|
| PGM | Precision Guided Munitions |
| PNT | Position, Navigation and Timing |
| RNOSC | Regional Network Operations and Security Center |
| RSSC | Regional SATCOM Support Center |
| S3 | The operations section of the staff of an Army unit commanded by a colonel or lieutenant colonel |
| SATCOM | Satellite Communications |
| SATCON | Satellite Control |
| SATRANS | Satellite Transit |
| SHF | Super High Frequency portion of the electromagnetic spectrum; used for SATCOM |
| SIPRNet | DoD's secure Internet Protocol Routing Network, a virtual private network |
| SMDC | US Army's Space and Missile Defense Command |
| SOM | SATCOM Operational Manager |
| Space IPB | Space Intelligence Preparation of the Battlefield |
| SPACEAF | US Air Force's Space Air Forces—the 14th Air Force |
| SSDC | US Army's Space and Strategic Defense Command |
| SSE | Space Support Element |
| STRATCOM | US Strategic Command, a unified combatant command of the US with responsibility for strategic warning, nuclear attack, space operations, information operations and global strike |
| TENCAP | Tactical Exploitation of National Capabilities |
| TRADEX | Trading and Discrimination Experiment |
| TRADOC | US Army Training and Doctrine Command |
| UA | Unit of Action—a brigade-level organization envisioned to be part of the US Army's Objective Force |
| UAV | Unmanned Aerial Vehicle |
| UE | Unit of Employment—a division-level organization envisioned to be part of the US Army's Objective Force |
| UHF | Ultra High Frequency portion of the electromagnetic spectrum; used for SATCOM |
| US | United States |
| USASOC | US Army Special Operations Command |
| USSR | Union of Soviet Socialist Republics |

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